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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/736,354

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Robert Oliver Buckingham

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EXAMINER

PILKINGTON, JAMES

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/736,354	Applicant(s) BUCKINGHAM ET AL.	
	Examiner JAMES PILKINGTON	Art Unit 3682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-10,12,13,15,17-26,28-33 and 36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-10,12,13,15,17-26,28-33 and 36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003, 27 December 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the at least one wire extending from said first link and said second link (claims 1 and 36) must be shown or the feature(s) canceled from the claim(s). The drawings only appear to show that the cable extends through the first link 13 only. No new matter should be entered. See Remarks below

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 4, 5, 6-10, 12, 13, 15, 17-26, 28-33, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stelle, USP 3,266,059, in view of Irwin et al, USP 3,504,902.

Re clm 1, Stelle discloses a link assembly for a robot arm comprising:

- First and second link members (75-80) configured in a cooperating mating relationship
- At least one wire (106 or 108) extending from said first link member to said second member, said at least one wire including a preload so as to maintain said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is the cables that hold the joints together then the cables must be preloaded).

Stelle does not disclose a resilient elastomer disposed between said first and second members and the elastomer is bonded to both of the first and second link members, and is maintained under compression.

Irwin teaches a resilient elastomer (C3/L43-53) bearing disposed between two members (11 and 12) and the elastomer is bonded to both of the first and second link

members (bonded at faces 13 and 14) and is maintained under compression (disposed between two elements) for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling (C1/L62-65) thus providing the predictable result of stabilizing the robot arm.

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and second link members, and is sufficiently thin and maintained under compression, as taught by Irwin, for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling thus providing the predictable result of stabilizing the robot arm.

Re clm 2 and 9, Irwin discloses that the elastomer is made of plastic which is a synthetic rubber and/or a laminate (C3/L43-68).

Re clm 4, well a specific thickness is not disclosed by Irwin it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a specific thickness range in order to conform to the compressional force inputs, and/or cost specifications of the assembly, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re clm 6, Irwin discloses each surface of the elastomeric layer contiguous the member is secured (compressed between the members 11 and 12) so that in operation,

relative movement between the members produces shear movement within the elastomer, the arrangement being such that the thinness of the layer reduces the tendency towards compression thereby imparting improved stability for the positioning of the components.

Re clm 7, Irwin discloses the elastomer means comprising a plurality of layers of elastomer (see Figures 3-8).

Re clm 8, Irwin discloses an interleaving rigid layer (17a-c and 20) is bonded to adjacent elastomer layers (16) to separate one layer from its neighbor (see Figures 6-8).

Re clm 10, Irwin discloses the interleaving layer (17a-c and 20) between each layer of elastomer (16) is of a material, which is bondable to or capable of being keyed to the elastomer (C3/L43-55).

Re clms 12 and 13, Irwin discloses that the interleaving layer comprises a metal layer, a resin layer, glass fiber, or a mat of either woven or unwoven material (C3/L43-55, Irwin discloses metal or plastic).

Re clm 15, Stelle discloses said at least one wire (106 or 108) comprises control means for controlling the movement (the wires are control means connected to a module) of said link assemblies within the segment.

Re clm 17, Stelle discloses that the control means comprises 3 wires (not shown in detail but Figure 5 shows multiple holes capable of receiving the wires also see C2/L48-50).

Re clm 18, Stelle discloses that the wires (106, 108) are tensioned to maintain the links under compression, the arrangement being such that application of differential tension between the wires causes or allows the segment to move or bend.

Re clm 19, Stelle in view of Irwin discloses that the first link member comprises an outer disc (98) having holes for control wires (Figures 5 and 6) and the second link member comprises an inner disk (88) which is adapted to be disposed generally inwardly of the outer disc (98) and which has a central bore (94) which has a bore to accommodate at least one of control and power means (100) for the work head and a rubber disc layer (Irwin).

Re clm 20, Stelle discloses a plurality of said segments (75-80) in which control means is provide for each segment.

Re clm 21, Stelle discloses each segment terminates in an end cap having wire conduit means for the control wires of other segments of the arm and anchorage means arcuately spaced about the cap for securing the control wires for the segment in question (Figure 6).

Re clm 22, Stelle discloses at least one of the members of each link is provided with means for guiding the wires from one end of the segment to the other (the holes).

Re clm 23, Stelle discloses each wire is disposed externally of the segment links and terminates in a ferrule (110, 112).

Re clm 24, Stelle discloses that each control wire is operated by an actuator (C3/L3-17).

Re clm 25, Stelle discloses each that each cable is provided with an actuator. Also, it would have been obvious to one of ordinary skill in the art at the time of the invention to pass the cables around pulleys to help align the cables before entering the segment.

Re clm 26, Stelle discloses each link is produced as a pair of half links which permit back to back assembly, the arrangement being such that an inner link (88) and an outer link (98) may be assembled with its associated bonding layer to form unitary link components (75-80), a plurality of which together can be assembled to form a segment.

Re clm 28, Stelle discloses locating dowels (rounded portion of 88) provided in mating holes (90).

Re clms 29 and 30, Stelle discloses an external sleeve (86) which is a bellows-type sheath (see Figure 4).

Re clm 31, Stelle discloses that the sleeve comprises a material and a configuration which is selected to increase the torsional stiffness of the arm (rib portions can only compress until the contact one another).

Re clms 32 and 33, the sleeve is capable of being filled with a lubricant.

Re clm 36, Stelle discloses a link assembly for a robot arm comprising:

- First and third link members (75-80) having respectively adjacent spherical surfaces (88, 90) formed to fit together
- At least one wire (106 or 108) extending from said first link member to said third member said at least one wire including a preload so as to maintain

said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is the cables that hold the joints together then the cables must be preloaded).

Stelle does not disclose a resilient elastomer disposed between said first and second members and the elastomer is bonded to both of the first and second link members, and is sufficiently thin and maintained under compression.

Irwin teaches a resilient elastomer (C3/L43-53) bearing disposed between two members (11 and 12) and the elastomer is bonded to both of the first and second link members (bonded at faces 13 and 14) and is maintained under compression (disposed between two elements) for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling (C1/L62-65) thus providing the predictable result of stabilizing the robot arm.

Upon the combination said adjacent spherical surfaces of said first, second and third link members are keyed or bonded to one another such that during articulation of the arm said third link (Irwin) rotates about a point of rotation relative to said first link and the distance between the spherical surfaces (88, 90) of said first and third links remains substantially constant; and said elastomeric material is maintained under compression by said at least one wire such that substantially no compressive deformation of said elastomeric material occurs during rotation.

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and

second link members, and is sufficiently thin and maintained under compression, as taught by Irwin, for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling thus providing the predictable result of stabilizing the robot arm.

Response to Arguments

4. Regarding the Applicant's arguments directed to the drawing objection above.

The claim states that there are "first and second link members each adapted for limited movement one with respect to the other" and later states "characterized in that the first and second link members are configured in a cooperating mating relationship and the elastomer is disposed between them as a layer and the elastomer is keyed or bonded to both of the first and second link members." In view of these limitations it appear the applicant is claiming characters 12 and 13 as the first and second link member. The claim as recites "at least one wire extending from the first link member to the second link member," this is not shown in the drawings. As can be clearly seen in Figure 1 the holes 25 for the cable are only located in link member 13 and the cord only extends from one link 13 to an adjacent link 13 not link 12. A similar problem is present in claim 36.

5. Applicant's arguments filed 3/12/08 have been fully considered but they are not persuasive.

6. The Applicant argues that Irwin is non-analogous art as it relates to a connection between a nozzle or exit cone to a body of a rocket engine and is not always in a state of compression as required by the claim (page 8-9 of the remarks).

In response to applicant's argument that Irwin is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Irwin is pertinent to the particular problem of creating a flexible and compressive joint between linked components.

Upon the combination of Stelle in view of Irwin the flexible joint would be between each link of Stelle. Stelle's robotic arm is held together by compression applied to the links by the springs. When a flexible joint member is inserted between two links that are held together by compression forces the flexible joint would also be held in a state of compression. Even though Irwin states that his flexible member can also extend does not mean it must extend and it is capable of being used in a compression environment.

7. In response to applicant's argument that a "relatively thick stabilizing ring" would render Stelle in view of Irwin a non-functioning product (page 10), the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the

test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In this case, Irwin would indeed suggest to one of ordinary skill in the art that an elastomer/flexible joint can be placed in between two moving components. The size of the elastomer is dependent on the environment in which it is used.

8. In response to the applicant's argument that the examiner has not provided any evidence of how the combination would increase predictability or even function (page 10). The *KSR International Co. V. Teleflex Inc.* ruling does not require an explanation on how predictability would increase. KSR only requires that the resulting combination yield predictable results. In this case the predictable result set forth by the examiner above is an increase in the stabilization feature of the robotic arm in Stelle.

9. In response to the applicant's argument that the resulting combination would also result in the elastomer crushing the springs (page 11).

The examiner does not understand what the applicant is arguing. How can an elastomer which is providing an equal and opposite force as that being applied by the springs crush the springs? In the combination the springs apply the compression force to compress the elastomer, the elastomer responds by applying a force to tension the springs. These equal and opposite actions act to stabilize the system resulting in a robotic arm as shown in Stelle which has an increase in stability.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pilkington whose telephone number is (571) 272-5052. The examiner can normally be reached on Monday-Friday 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Ridley can be reached on (571) 272-6917. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3682

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. P./
Examiner, Art Unit 3682
4/10/08

/Richard WL Ridley/

Supervisory Patent Examiner, Art Unit 3682